SEARS, ROEBUCK AND COMPANY
WAREHOUSE AND OUTLET STORE
SOIL EXPLORATION REPORT

WAIAU, OAHU, HAWAII
TAX MAP KEY: 9-8-02: POR. 3

To:
PACIFIC CONSTRUCTION COMPANY

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

APRIL 10, 1973

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

WALTER LUM
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April 10, 1973

MR. JON T. EICHOLTZ
Pacific Construction Company
2826 Kaihikapu Street
Honolulu, Hawaii 96819

Dear Mr. Eicholtz:

Subject: Sears, Roebuck and Company
Warehouse and Outlet Store
Soil Exploration Report
(for foundation design purposes)
Waiau, Oahu, Hawaii
Tax Map Key: 9-8-02: Por. 3

Transmitted herewith is our soil exploration report for foundation design purposes for the proposed Sears, Roebuck and Company Warehouse and Outlet Store at Waiau, Oahu, Hawaii.

In general, most of the soils found at the site may be classified as silty clays or clayey silts with some boulders and possibly some expansive clay pockets.

Spread footing foundations may be used for the buildings.

Subdrains and surface drains are recommended, particularly over large paved areas.

This report includes a Boring Location Sketch, boring logs, laboratory test results, recommendations and limitations.

Respectfully submitted,

WALTER LUM ASSOCIATES, INC.

By Ezra Koike
Ezra Koike

BD/EK:rmf

C O N T E N T S

SEARS, ROEBUCK AND COMPANY
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SCOPE OF EXPLORATION

The purpose of this exploration was to determine general soil conditions for foundation design purposes for the proposed Sears, Roebuck and Company Warehouse and Outlet Store, Waiau, Oahu, Hawaii.

This report includes field explorations, laboratory tests, general recommendations for building foundation design and limitations.

FIELD EXPLORATION AND LABORATORY TESTS

Twelve borings were made at the site at locations shown on the Boring Location Sketch.

Borings were made with 4-in. diameter augers using carbide drag bits. Soil samples were recovered with 2-in. o.d. thin-wall tube and 2-in. standard split spoon samplers driven with a 140-lb hammer falling 30 inches.

Laboratory tests included: natural water content, unconfined compression, Atterberg limit, grain-size analysis, AASHO T-180-57 density, expansion and CBR.

SOIL CLASSIFICATION SYSTEM

Soil samples were visually observed and subjected to appropriate tests in the laboratory. Based on visual observations and laboratory tests, the soil descriptions given on the boring logs are generally made in accordance with the "Unified Soil Classification System."

GENERAL SITE CONDITIONS

The proposed site for the Sears, Roebuck and Company Warehouse and Outlet Store is a triangular plot located on the western side of new Moanalua Road at Waiau, Oahu, Hawaii. Interstate H-1 borders the southern boundary of the site. Kamehameha Highway borders the southwest corner of the proposed site.

The northern 2/3 of the triangular site is covered with sugar cane and the southern 1/3 or base of the triangular site is in a small depression or swale that drains in a southwesterly direction.

Some boulder stockpiles were noted in the southeastern portion of the site.

An existing sewer line is located along the southeastern corner and along the southern boundary of the site.

An existing lined channel which collects the drainage water from the H-1 Interstate Highway is located along the southern boundary.

Electric power lines run along Kamehameha Highway and along the western boundary of the site.

The elevation of the site generally varies from about 110 ft at the northern edge of the site to about 45 ft at the southwestern corner.

The site generally drains from north towards the south and southwest at a gradient of about 10% with local variations.

INTERPRETATION OF SOIL CONDITIONS

From the field explorations and laboratory test results, the soils encountered in the borings may be approximated as follows:

Medium to stiff reddish-brown and mottled gray-brown clayey silt and silty clay "MH" with decomposed rock to about 50 ft, the maximum depth drilled.

Except for Boring Nos. 3, 11 and 12, rocks or boulders were encountered in the borings at various depths during the field exploration.

Some expansive clay "CH" pockets were noted in Boring Nos. 4, 6, 9 and 12.

Water was not noted in the borings during the field explorations.

Variations to the above soil conditions are to be expected in localized areas. For more detailed descriptions of soils encountered in the borings, refer to the boring logs.

DISCUSSION AND RECOMMENDATIONS

A warehouse about 316 by 820 ft in plan is proposed in the southern portion of the triangular site. The finished floor elevation is proposed at about 68 ft.

A basement or lower level room will be constructed at the southwest corner of the building.

A motor pool building about 50 ft by 60 ft in plan is proposed to be located centrally in the eastern portion of the site. The proposed finished floor elevation is about 63.48 ft.

A parking area is proposed in the northern half of the triangle and southwestern corner of the site for about 331 car stalls.

The entrance driveway from Kamehameha Highway to the warehouse site will probably be subjected to heavy traffic.

Site Grading

The preliminary grading plan shows fills of about 2 to 25 ft in the southern half of the site and cuts up to about 20 to 30 ft in the northern portion.

The site grading or cuts should be designed so that lateral supports for the tower for the high tension power lines are not removed, particularly at the north corner of the site.

TOTAL QUANTITY —

The proposed warehouse will be on a fill over a natural depression. Subdrains should be installed in the low area to minimize the build up of ground water seepage at a later date.

The construction of fills, particularly over a swale at the southern portion of the site, should be done as soon as practicable to allow as much time as possible for settlement to occur prior to the start of construction.

Grading of the site, particularly construction of fills, should be done prior to building construction. The site should be graded to prevent ponding of water and to provide positive drainage away from the proposed structures.

Care should be taken that non-expansive materials are used for the top 2 ft of fills, particularly under the warehouse slab.

Other general guidelines for site grading follow:

The site should be cleared and grubbed. Surface vegetation and miscellaneous debris should be cleared and removed prior to site filling.

Loose surface and stockpiled soils should be stripped to stiff natural ground before the placement of fills. Loose surface soils at finish grade should be scarified and recompacted.

Localized soft pockets encountered during the site preparation should be excavated and replaced with compacted select material.

Loose soils along the bottom and sides of the natural drainageway should be stripped to stiff ground. Soft spots should be removed and drained, and the excavation backfilled with select materials in thin lifts.

Subdrains and laterals should be placed along the bottom of the drainageways and swale before the construction of fills. The locations of subdrains should be determined in the field after clearing and grubbing.

Fills should be constructed in approximately level layers starting at the lower end and working upward.

Fills should be laid in 6-in. compacted layers to 90% of maximum density in accordance with AASHO T-180-57 density.

Slopes

From the preliminary plans, it appears that cut slopes of about 20 to 30 ft are proposed along the boundary of the northern parking area.

After the grading plans are developed, the plans should be checked to verify whether or not lateral support for the power line tower is available.

In general, cut and fill slopes of 2 horizontal to 1 vertical or flatter should be used.

For slope heights (top to toe) greater than 20 ft, 8-ft-wide benches should be placed at height intervals of about 15 ft.

To minimize erosion, the runoff from rainstorms should be diverted away from slopes by berms or ditches whenever practicable.

The surface of fill slopes should be compacted by cat-tracking or with a sheepsfoot roller.

Slope planting is recommended on cut and fill slopes to minimize erosion.

Slope adjustments or other precautions may be necessary if seepage zones, expansive clay pockets or soft spots are encountered in localized areas.

Foundations

The main floor will be several feet below the natural ground at the east end of the warehouse and over 18 ft of fill about the middle of the building.

Retaining walls are proposed along the southern side of the building to retain 15 or more feet of fill.

In general, spread or continuous footing foundations may be used for footings on the existing ground or on recompacted fill except along the southern boundary of the site where retaining walls are proposed.

The following may be used as a guide for footing foundation design:

1. The bottom of the footing should be about 2 ft below the finished grade.

2. If a loose pocket or soft spot is encountered at the bottom of the footing excavation, the loose pocket should be removed and replaced with select compacted on-site soils or well-graded granular borrow material. The backfill should be placed in thin level layers and rammed tight against the sides of the excavation.

3. Bearing values of 3000 p.s.f. may be used on stiff soils near the surface or on compacted fill.

4. Deep grade beams between columns and around the perimeter of the building will help

stiffen the superstructure and reduce the effects of differential settlements.

5. The bottom of excavations should be compacted before placing concrete.

Retaining Walls

Retaining walls are contemplated for the south and west sides of the warehouse building. Retaining walls over 20 ft are contemplated for the south side boundary.

Because of the soils at the site and a sewer trench along the southern boundary, it will be difficult to restrain the lateral movement of the building wall. The total lateral earth pressure may be greater than the 20 ft of fill contemplated. The building wall may move outward and the floor may crack and settle if the wall is not restrained laterally. See Figure 1 showing lateral earth pressure with relation to the sewer line.

To minimize the lateral movement of the southern wall, several alternatives may be considered:

1. Move the southern wall away from the sewer line a sufficient distance so that the base of the wall will be below a line drawn upward at a 2 horizontal to 1 vertical ratio from the invert of the sewer (see Figure 2-A).

2. Construct the wall along the sewer easement with the footings tied back to deadman anchors (see Figure 2-B).

3. Construct the wall along the sewer easement with pile foundations and with tie-backs to deadman anchors (see Figure 2-C).

Lateral Pressures Against Retaining Walls

Fairly well-graded granular material or select granular material should be used for backfilling against the wall.

Retaining walls restrained at top should be designed for earth pressures approximating "at-rest" conditions.

A lateral earth pressure of about 50 p.c.f. equivalent fluid plus surcharge load allowance should be used for the wall design. The above fluid pressure assumes that drainage of the backfill is provided.

Good drainage behind the foundation wall should be provided.

Concrete Slabs on Ground

Concrete slabs in the warehouse will cover a large area. Because of the high fills and slightly expansive nature of the soils, some waving of the floor slab may

be expected. To minimize the effects of waves on the surface of the floor slab, the fill should be constructed as early as practicable and the construction of the floor slab delayed as long as practicable.

For concrete slabs on ground, a base course of 4 in. of well-graded gravel less than 3/4-in. and greater than 1/4-in. in size is recommended.

Roadway and Parking Areas

In general, for light automobile traffic and drained subgrade conditions, an estimate of the roadway and parking area pavement thickness is as follows:

1. Wearing course - 2-in. asphaltic concrete.
2. Base course - 6-in. base course.
3. Subbase course - 6-in. select material over a prepared subgrade.

Where expansive clay pockets are encountered, the clay should be removed to a depth of 18 in. below the subbase course and replaced with non-expansive on-site materials compacted in thin lifts.

Where truck traffic is anticipated, the thickness of the wearing course may be increased to 2-1/2-in. asphaltic

concrete and 12-in. select material may be used for the subbase course.

The subgrade should be compacted and shaped to drain. To avoid the ponding of water and softening of the subgrade at low points, weep holes should be placed at subgrade levels thru the walls of the catch basins which are placed in these low areas.

Subdrainage

The main floor of the building will be below the natural ground surface at the north and east sides of the building. Surface and ground water seepage from the upper areas will be flowing toward the building.

Subdrains around the perimeter of the building will minimize the ground water seepage effects. The invert of the subdrains should be below the bottom of the floor slab.

Subdrains should be placed around the basement walls. Subdrainage should also be provided at the lower end of the parking lot where traffic will be relatively heavy.

Utilities

Utilities should be placed after the fills are constructed. Utility lines should be designed with flexible joints, particularly where lines are connected to structures.

Unforeseen Conditions

Unforeseen or undetected conditions such as soft spots, seepage water or expansive soil pockets may occur in localized areas and will have to be adjusted and corrected in the field as they are detected.

BORING LOGS

The stratification lines shown on each of the boring logs represent the approximate boundary between soil types and the transition may be gradual.

Symbols

Symbols used generally are in accordance with the Unified Soil Classification System.

Where a parenthesis "(MH)" is used, the soil sample was classified by visual observation of the sample recovered.

Where no parenthesis "MH" is used, the soil sample was classified from either the Atterberg limit or sieve analysis test results.

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: SEARS, ROEBUCK AND COMPANY WAREHOUSE AND OUTLET STORE

LOCATION: Waiau, Oahu, Hawaii
Tax Map Key: 9-8-02: Por. 3

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2"SS-2"O.D. THIN WALL TUBE
2"SS-2" STANDARD SPLIT SPOON

BORING NO. 2 Sheet No. ____ of ____
Driller: W. LUM ASSOC., INC. Date: MAR. 14 & 15, 1973
Field Party: MEYER, OSHIRO,
Type of Boring: AUGER (MOBILE 2-50) Diam.: 4"
Elev.: 87'± * Datum: —
Drill Bit: T.C. DRAG

Water Level				
Time	—			
Date	3-14-73			

Unified Soil Classification	DRILL RATE	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	2"O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
		ELEV. = 87'± ↓ *	0									
(CL-ML)		HARD, RED BROWN SILTY CLAY		2"SS	2-A	—	21	—	—	—		17/0.5'
			5	2"S	2-B	30	24	42	—	—		20/0.5' 21/0.5'
								γ_W = 109				
								γ_D = 88				
ML		STIFF, BROWN CLAYEY SILT										
			10	2"SS	2-C	—	23	—	—	—		
MH		STIFF, GRAY BROWN CLAYEY SILT	15	2"S	2-D	34	32	51	—	—		11/0.5' 18/0.5'
							36		6360			
		ROCK OR BOULDER						γ_W = 115				
								γ_D = 84				
			20									
SM		MEDIUM DENSITY TO DENSE GRAY BROWN SILTY SAND W/DECOMPOSED ROCK		2"SS	2-E	—	40	—	—	—		
			25	2"SS	2-F	—	31	—	—	—		53/0.5'
(MH)		STIFF, MOTTLED BROWN CLAYEY SILT W/DECOMPOSED ROCK	30	2"SS	2-G	—	24	—	—	—		
			35	2"SS	2-H		NO	RECOVERY				61/0.1'
		GRAYISH BROWN DECOMPOSED ROCK										HAMMER BOUNCES
		41.5'-43.5' 30 MIN.	40	2"SS	2-I	—	23	—	—	—		63/0.4'
		ROCK OR BOULDER										
		END OF BORING @ 43.5'										

NOTE:
γ_W = WET DENSITY, PCF
γ_D = DRY DENSITY, PCF

*ELEVATION ESTIMATED FROM GRADING PLAN

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: SEARS, ROEBUCK AND COMPANY WAREHOUSE AND OUTLET STORE

LOCATION: Waiau, Oahu, Hawaii

Tax Map Key: 9-8-02: Por. 3

HAMMER:
Weight 140#
Drop 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 3 Sheet No. ____ of ____

Driller W. LUM ASSOC., INC. Date MAR. 13 & 14, 1973

Field Party MEYER, OSHIRO, CHOW

Type of Boring AUGER (B-30) Diam. 4"

Elev. 83' ± * Datum —

Drill Bit T.C. DRAG

Water Level	NOT NOTICED			
Time	—			
Date	3-13-73			

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 83' ± *	0								
(ML)	HARD, RED BROWN CLAYEY SILT			3-A	–	31	–	–	–	19/0.5'
		5								
(ML)	STIFF, BROWN CLAYEY SILT			3-B	–	33	–	–	–	44
		10		3-C	–	32	–	–	–	
(MH)	STIFF MOTTLED GRAY BROWN SILTY CLAY									
		15		3-D	–	37	–	–	–	34/0.5' 21/0.1'
	DENSE, MOTTLED BROWN SILTY SAND W/ DECOMPOSED ROCK									
	DENSE, GRAY BROWN SILTY SAND & DECOMPOSED ROCK	20		3-E	–	24	–	–	–	51/0.2'
		25		3-F	–	37	–	–	–	64
	DENSE, MOTTLED GRAY SILTY SAND & DECOMPOSED ROCK	30		3-G		NO RECOVERY				30/0.4' HAMMER BOUNCES
		35								
	END OF BORING @ 40.4'	40		3-H	–	20	–	–	–	58/0.4'

*ELEVATION ESTIMATED FROM GRADING PLAN

SEAR'S

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: SEARS, ROEBUCK AND COMPANY WAREHOUSE AND OUTLET STORE

LOCATION: Waiau, Oahu, Hawaii

Tax Map Key: 9-8-02: Por. 3

BORING NO. 4 Sheet No. ____ of ____

Driller W. LUM ASSOC, INC. Date MAR. 14, 1973

Field Party MEYER, OSHIRO

Type of Boring AUGER (MOBILE B-50) Diam. 4"

Elev. 69'± * Datum -

Drill Bit T.C. DRAG

Water Level NOT NOTICED

Time -

Date 3-14-73

HAMMER:
Weight 140#
Drop 30"

SAMPLER: 2"SS - 2" O.D. THIN WALL TUBE
2"SS - 2" STANDARD SPLIT SPOON

Unified Soil Classification	DRILL RATE	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER, BLOWS/0.5'
		ELEV. = 69'± *	0									
				2"SS	4-A	-	21	-	-	-		17/0.5'
(ML)		HARD, RED BROWN SILTY CLAY	5	2"S	4-B	-	21	-	41460	-		28/0.4'
								γ_W = 116				
								γ_D = 96				
			10	2"SS	4-C	30	27	61	-	-		40/0.3'
CH		HARD, MOTTLED BROWN CLAY										
	13'-15' 20 MIN.	ROCK OR BOULDER										
		END OF BORING @ 15'	15									

NOTE:
γ_W = WET DENSITY, P.C.F.
γ_D = DRY DENSITY, P.C.F.

* ELEVATION ESTIMATED FROM GRADING PLAN

SEAR'S

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: SEARS, ROEBUCK AND COMPANY WAREHOUSE AND OUTLET STORE

LOCATION: Waiau, Oahu, Hawaii

Tax Map Key: 9-8-02: Por. 3

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 5 Sheet No. _____ of _____

Driller: W. LUM ASSOC., INC. Date: MAR. 13, 1973

Field Party: MEYER, OSHIRO, CHOW

Type of Boring: AUGER (MOBILE B-50) Diam.: 4"

Elev.: 73'± * Datum: _____

Drill Bit: T.C. DRAG

Water Level: NOT NOTICED

Time: _____

Date: 3-13-73

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 73'± *	0								
(ML)	HARD, RED BROWN CLAYEY SILT			5-A	–	27	–	–	–	25/0.5'
		5								
(ML)	HARD, BROWN CLAYEY SILT			5-B	–	30	–	–	–	54
	ROCK OR BOULDER									
		10								
(ML-MH)	HARD, BROWN CLAYEY SILT			5-C	–	33	–	–	–	
	ROCK OR BOULDER	15								
	END OF BORING @ 20.1'	20		5-D		NO RECOVERY				50/0.1' HAMMER BOUNCES

* ELEVATION ESTIMATED FROM GRADING PLAN

SEARS

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: SEARS, ROEBUCK AND COMPANY WAREHOUSE AND OUTLET STORE

LOCATION: Waiau, Oahu, Hawaii

Tax Map Key: 9-8-02: Por. 3

HAMMER: Weight 140# Drop 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 6 Sheet No. _____ of _____

Driller W. LUM ASSOC., INC. Date MAR. 13, 1973

Field Party MEYER, OSHIRO, CHOW

Type of Boring AUGER (MOBILE B-50) Diam. 4"

Elev. 70'± * Datum _____

Drill Bit I.C. DRAG

Water Level					
Time					
Date	3-13-73				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 70'± ↓ *	0								
(CL-OH)	STIFF, RED BROWN SILTY CLAY W/SOME DECOMPOSED ROCK	5		G-A	–	22	–	–	–	
				G-B	–	24	–	–	–	
CH	STIFF, REDDISH BROWN CLAY	10		G-C	25	27	59	–	–	
ML	STIFF, REDDISH BROWN SILTY CLAY	15		G-D	28	27	47	–	–	
	ROCK OR BOULDER	20		G-E	–	27	–	–	–	42/0.5'
(MH)	HARD, RED BROWN CLAYEY SILT W/SOME CLAY POCKETS	25		G-F	–	30	–	–	–	53/0.5'
	END OF BORING @ 25.5'									

* ELEVATION ESTIMATED FROM GRADING PLAN

SEARS

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: SEARS, ROEBUCK AND COMPANY WAREHOUSE AND OUTLET STORE

LOCATION: Waiau, Oahu, Hawaii

Tax Map Key: 9-8-02: Por. 3

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 7 Sheet No. _____ of _____

Driller: W. LUM ASSOC., INC. Date: MAR. 12, 1973

Field Party: MEYER, OSHIRO

Type of Boring: AUGER (MOBILE B-50) Diam.: 4"

Elev.: 48'± * Datum: _____

Drill Bit: T.C. DRAG

Water Level: NOT NOTICED

Time: _____

Date: 3-12-73

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV.= 48'± *	0								
(CL-ML)	HARD, RED BROWN SILTY CLAY			7-A	-	22	-	-	-	55
(MH)	HARD, BROWN SILTY CLAY	5		7-B	-	29	-	-	-	
(MH)	HARD, BROWN CLAYEY SILT W/ DECOMPOSED ROCK	10		7-C	-	29	-	-	-	49/0.2'
		15		7-D	-	32	-	-	-	63/0.5'
SM	DENSE, GRAYISH BROWN SILTY SAND W/ DECOMPOSED ROCK	20		7-E	-	39	-	-	-	48
	ROCK OR BOULDER	25		7-F		NO RECOVERY				37/0.1'
	END OF BORING @ 25.1'									

* ELEVATION ESTIMATED FROM GRADING PLAN

SEAR'S

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: SEARS, ROEBUCK AND COMPANY WAREHOUSE AND OUTLET STORE

LOCATION: Waiau, Oahu, Hawaii
Tax Map Key: 9-8-02: Por. 3

HAMMER:
Weight 140#
Drop 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 8 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date MAR. 13, 1973
Field Party MEYER OSHIRO, CHOW
Type of Boring AUGER (MOBILE B-50) Diam. 4"
Elev. 57'± * Datum —
Drill Bit T.C. DRAG

Water Level				
Time	—			
Date	3-13-73			

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV.: 57'± *	0								
(CL-ML)	HARD, RED BROWN SILTY CLAY W/DECOMPOSED ROCK & ROCK OR BOULDER	5		S-A	—	9	—	—	—	57/0.5'
				S-B	—	25	—	—	—	59
(MH)	HARD, MOTTLED BROWN CLAYEY SILT W/DECOMPOSED ROCK	10		S-C	—	39	—	—	—	69
		15		S-D	—	45	—	—	—	60
	DENSE TO MEDIUM DENSITY GRAYISH BROWN SILTY SAND & DECOMPOSED ROCK	20		S-E	—	41	—	—	—	
	ROCK OR BOULDER									
	END OF BORING @ 24'									

* ELEVATION ESTIMATED FROM GRADING PLAN

SEARS

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: SEARS, ROEBUCK AND COMPANY WAREHOUSE AND OUTLET STORE

LOCATION: Waiau, Oahu, Hawaii

Tax Map Key: 9-8-02: Por. 3

HAMMER: Weight 140# Drop 30"

SAMPLER: 2"SS. 2" O.D. THIN WALL TUBE; 2"SS. 2" STANDARD SPLIT SPOON

BORING NO. 9 Sheet No. ____ of ____

Driller W. LUM ASSOC., INC. Date MAR. 14, 1973

Field Party MEYER, OSHIRO

Type of Boring AUGER (MOBILE B-50) Diam. 4"

Elev. 63'± * Datum —

Drill Bit T.C. DRAG

Water Level				
NOT NOTICED				
Time —				
Date 3-14-73				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER, BLOWS/0.5'
	ELEV = 63'± *	0									
(MH)	HARD, REDDISH BROWN SILTY CLAY		2"SS	9-A	-	25	-	-	-		19/0.5'
CH	HARD, REDDISH BROWN CLAY	5	2"S	9-B	28	24	62	52760	-		28/0.5'
							γ_W = 123				
							γ_D = 99				
CL-ML	HARD, REDDISH BROWN SILTY CLAY	10	2"S	9-C	25	24	40	3710	-		7/0.5' 12/0.5'
							γ_W = 114				
							γ_D = 92				
MH	HARD, BROWN SILTY CLAY	15	2"S	9-D	31	32	51	13470	-		18/0.5'
							γ_W = 122				
							γ_D = 93				
	DENSE, MOTTLED GRAY SILTY SAND W/ DECOMPOSED ROCK	20	2"SS	9-E	-	41	-	-	-		36/0.5'
	ROCK OR BOULDER										
	END OF BORING @ 24'										

NOTE:
γ_W = WET DENSITY, P.C.F.
γ_D = DRY DENSITY, P.C.F.

*ELEVATION ESTIMATED FROM GRADING PLAN

SEAR'S

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: SEARS, ROEBUCK AND COMPANY WAREHOUSE AND OUTLET STORE

LOCATION: Waiau, Oahu, Hawaii
Tax Map Key: 9-8-02: Por. 3

HAMMER:
Weight 140#
Drop 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 10 Sheet No. ____ of ____

Driller W. LUM ASSOC., INC. Date MAR. 12, 1973

Field Party MEYER, OSHIRO

Type of Boring AUGER (MOBILE B-50) Diam. 4"

Elev. 43'± * Datum —

Drill Bit T.C. DRAG

Water Level	NOT NOTICED				
Time	—				
Date	3-12-73				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 43'± *	0								
(MH)	HARD, MOTTLED BROWN SILTY CLAY W/DECOMPOSED ROCK (FILL?)			10-A	-	24	-	-	-	40/0.5'
(MH)	STIFF, RED BROWN SILTY CLAY	5		10-B	-	27	-	-	-	
	DENSE, MOTTLED BROWN SILTY SAND W/DECOMPOSED ROCK	10		10-C	-	27	-	-	-	26/0.5'
	DENSE MOTTLED TAN BROWN SILTY SAND W/DECOMPOSED ROCK	15		10-D	-	27	-	-	-	51/0.3'
	ROCK OR BOULDER									
	DENSE, MOTTLED GRAY BROWN DECOMPOSED ROCK W/CLAYEY SILT POCKETS	20		10-E	-	46	-	-	-	24/0.5'
	GRAY BROWN DECOMPOSED ROCK	25		10-F	-	25	-	-	-	51/0.3'
	END OF BORING @ 25.3'									

* ELEVATION ESTIMATED FROM GRADING PLAN

SEAR'S

WALTER LUM ASSOCIATES, INC.

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: SEARS, ROEBUCK AND COMPANY WAREHOUSE AND OUTLET STORE

LOCATION: Waiau, Oahu, Hawaii

Tax Map Key: 9-8-02: Por. 3

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 11 Sheet No. ____ of ____

Driller: W. LUM ASSOC., INC. Date: MAR. 12, 1973

Field Party: MEYER, OSHIRO

Type of Boring: AUGER (MOBILE B-50) Diam.: 4"

Elev.: 51'± * Datum: —

Drill Bit: T.C. DRAG

Water Level				
Time	—			
Date	3-12-73			

ELEV = 51'± * (0)

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
(CL-ML)	HARD, RED BROWN SILTY CLAY W/ DECOMPOSED ROCK (FILL?)	0	11-A	–	20	–	–	–	40/0.3'
(ML)	HARD, RED BROWN CLAYEY SILT	5	11-B	–	24	–	–	–	32/0.2'
		10	11-C	–	25	–	–	–	48/0.5'
(MH)	HARD, RED BROWN SILTY CLAY	15	11-D	–	28	–	–	–	51/0.5'
(MH)	HARD, MOTTLED BROWN SILTY CLAY	20	11-E	–	45	–	–	–	45/0.5'
	DENSE, GRAY BROWN SILTY SAND W/DECOMPOSED ROCK	25	11-F	–	46	–	–	–	47/0.5'
	END OF BORING @ 26'								

* ELEVATION ESTIMATED FROM GRADING PLAN

SEARS

WALTER LUM ASSOCIATES, INC.

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: SEARS, ROEBUCK AND COMPANY WAREHOUSE AND OUTLET STORE

LOCATION: Waiau, Oahu, Hawaii

Tax Map Key: 9-8-02: Por. 3

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 12 Sheet No. ____ of ____

Driller: W. LUM ASSOC., INC. Date: MAR. 12, 1973

Field Party: MEYER, OSHIRO

Type of Boring: AUGER (MOBILE B-50) Diam.: 4"

Elev.: 73'± * Datum: —

Drill Bit: T.C. DRAG

Water Level: NOT NOTICED
Time: —
Date: 3-12-73

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 73'± *	0								
(CL-ML)	HARD, RED BROWN SILTY CLAY			12-A	-	21	-	-	-	40/0.5'
		5		12-B	31	26	76	-	-	64
CH	HARD, BROWN CLAY									
MH	HARD, GRAY BROWN SILTY CLAY W/DECOMPOSED ROCK	10		12-C	35	28	64	-	-	43
		15		12-D	-	41	-	-	-	
(MH)	HARD, BROWN CLAYEY SILT W/DECOMPOSED ROCK									
		20		12-E	-	20	-	-	-	60/0.3'
	DENSE, MOTTLED BROWN SILTY SAND W/DECOMPOSED ROCK	25		12-F	-	40	-	-	-	50
	END OF BORING @ 26.5'									

* ELEVATION ESTIMATED FROM GRADING PLAN

SEARS ROEBUCK & COMPANY
WAREHOUSE & OUTLET STORE

TABLE I A - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	1	1	1	1
SAMPLE NO.		B	D	H
DEPTH BELOW SURFACE	SURFACE	5'-6'	15'-16.5'	35'-35.5'
DESCRIPTION	REDDISH-BROWN SILTY CLAY	REDDISH-BROWN CLAYEY SILT	MOTTLED REDDISH-BROWN SILTY CLAY	MOTTLED GRAY-BROWN SILTY SAND & DECOMP. ROCK
GRAIN-SIZE ANALYSIS (% Passing) Sieve				
1"				100
1/2"				100
#4				92.3
#10				73.5
#20				51.1
#40				39.5
#100				28.2
#200				23.8
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL	NATURAL	NATURAL	
Liquid Limit	46	45	65	
Plastic Limit	27	32	34	
Plasticity Index	19	13	31	
Dilatancy	SLOW	MEDIUM	NONE	
Toughness	MEDIUM	MEDIUM	MED.-HIGH	
Dry Strength	SLIGHT-MED.	SLIGHT-MED.	MEDIUM	
UNIFIED SOIL CLASSIFICATION	CL-ML	ML	MH	SM
APPARENT SPECIFIC GRAVITY	2.80			
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %	26.8			
Molding Dry Density, P.C.F.	97.0			
Swell upon saturation, %	0.3			
CBR at 0.1" Penetration	4.6			
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method)	A			
Dry to Wet or Wet to Dry	DRY TO WET			
Max. Dry Density (P.C.F.)	98.0			
Optimum Moisture (%)	24.5			

REMARKS:

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 3-31-73 By BT

SEARS ROEBUCK & COMPANY
WAREHOUSE & OUTLET STORE

TABLE I B - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	2	2	2	
SAMPLE NO.	B	D (BTM.)	E	
DEPTH BELOW SURFACE	5'-6'	15'-16'	20'-21.5'	
DESCRIPTION	BROWN CLAYEY SILT	GRAY-BROWN CLAYEY SILT	GRAY BROWN SILTY-SAND W/DECOMP. ROCK	
GRAIN-SIZE ANALYSIS (% Passing) Sieve				
1"			100	
1/2"			100	
#4			100	
#10			98.2	
#20			86.3	
#40			72.9	
#100			53.0	
#200			44.6	
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL	NATURAL		
Liquid Limit	42	51		
Plastic Limit	30	34		
Plasticity Index	12	17		
Dilatancy	NONE-SLOW	SLOW		
Toughness	MEDIUM	MEDIUM		
Dry Strength	SLIGHT-MED	SLIGHT-MED.		
UNIFIED SOIL CLASSIFICATION	ML	MH	SM	
APPARENT SPECIFIC GRAVITY				
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %				
Molding Dry Density, P.C.F.				
Swell upon saturation, %				
CBR at 0.1" Penetration				
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method ___)				
Dry to Wet or Wet to Dry				
Max. Dry Density (P.C.F.)				
Optimum Moisture (%)				

REMARKS:

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 3-31-73 By BT

SEARS ROEBUCK & COMPANY
WAREHOUSE & OUTLET STORE

TABLE I C - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	4	4	6	6
SAMPLE NO.		C		C
DEPTH BELOW SURFACE	SURFACE	10'-10.8'	SURFACE	10'-11.5'
DESCRIPTION	REDDISH-BROWN SILTY CLAY	MOTTLED BROWN CLAY	REDDISH-BROWN SILTY CLAY W/SOME DECOMP. ROCK	REDDISH-BROWN CLAY
GRAIN-SIZE ANALYSIS (% Passing) Sieve				
1"				
1/2"				
#4				
#10				
#20				
#40				
#100				
#200				
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL	NATURAL	NATURAL	NATURAL
Liquid Limit	43	61	50	59
Plastic Limit	28	30	27	25
Plasticity Index	15	31	23	34
Dilatancy	QUICK	SLOW	NONE	NONE
Toughness	MEDIUM	MEDIUM	MEDIUM	MEDIUM
Dry Strength	MEDIUM	HIGH	MED.-HIGH	HIGH
UNIFIED SOIL CLASSIFICATION	ML	CH	CL-CH	CH
APPARENT SPECIFIC GRAVITY	2.89			
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %	22.5		22.5	
Molding Dry Density, P.C.F.	96.2		104.4	
Swell upon saturation, %	2.0		0.9	
CBR at 0.1" Penetration	8.5		22.7	
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method ___)	A			
Dry to Wet or Wet to Dry	DRY TO WET			
Max. Dry Density (P.C.F.)	101.5			
Optimum Moisture (%)	23.8			

REMARKS:

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 3-31-73 By MT

SEARS ROEBUCK & COMPANY
WAREHOUSE & OUTLET STORE

TABLE ID - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	6	9	9	9
SAMPLE NO.	D	B	C	D
DEPTH BELOW SURFACE	15'-16.5'	5'-5.5'	10'-11'	15'-15.5'
DESCRIPTION	REDDISH-BROWN SILTY CLAY	REDDISH-BROWN CLAY	REDDISH-BROWN SILTY CLAY	BROWN SILTY CLAY
GRAIN-SIZE ANALYSIS (% Passing) Sieve				
1"				
1/2"				
#4				
#10				
#20				
#40				
#100				
#200				
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL	NATURAL	NATURAL	NATURAL
Liquid Limit	47	62	40	51
Plastic Limit	28	28	25	31
Plasticity Index	19	34	15	20
Dilatancy	NONE	NONE	SLOW	NONE
Toughness	MEDIUM	MED.-HIGH	MEDIUM	MEDIUM
Dry Strength	SLIGHT-MED.	HIGH	MEDIUM	MEDIUM
UNIFIED SOIL CLASSIFICATION	ML	CH	CL-ML	MH
APPARENT SPECIFIC GRAVITY				
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %				
Molding Dry Density, P.C.F.				
Swell upon saturation, %				
CBR at 0.1" Penetration				
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method ___)				
Dry to Wet or Wet to Dry				
Max. Dry Density (P.C.F.)				
Optimum Moisture (%)				

REMARKS:

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 3-31-73 By BT

SEARS ROEBUCK & COMPANY
WAREHOUSE & OUTLET STORE

TABLE I E - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	11	12	12	12
SAMPLE NO.	SURFACE	B	C	F
DEPTH BELOW SURFACE	0.5'-1.5'	5'-6.5'	10'-11.5'	25'-26.5'
DESCRIPTION	REDDISH-BROWN SILTY CLAY W/DECOMP. ROCK	BROWN CLAY	GRAY-BROWN SILTY CLAY W/DECOMP. ROCK	MOTTLED BROWN SILTY SAND W/DECOMP. ROCK
GRAIN-SIZE ANALYSIS (% Passing) Sieve				
1"				100
1/2"				100
#4				97.3
#10				82.1
#20				67.8
#40				60.4
#100				51.4
#200				46.3
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL	NATURAL	NATURAL	
Liquid Limit	47	76	64	
Plastic Limit	27	31	35	
Plasticity Index	20	45	29	
Dilatancy	NONE	NONE	NONE	
Toughness	MEDIUM	MEDIUM	MED-HIGH	
Dry Strength	MEDIUM	HIGH	MEDIUM	
UNIFIED SOIL CLASSIFICATION	CL-ML	CH	MH	SM
APPARENT SPECIFIC GRAVITY				
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %	22.4			
Molding Dry Density, P.C.F.	99.6			
Swell upon saturation, %	3.8			
CBR at 0.1" Penetration	3.3			
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method ___)				
Dry to Wet or Wet to Dry				
Max. Dry Density (P.C.F.)				
Optimum Moisture (%)				

REMARKS:

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

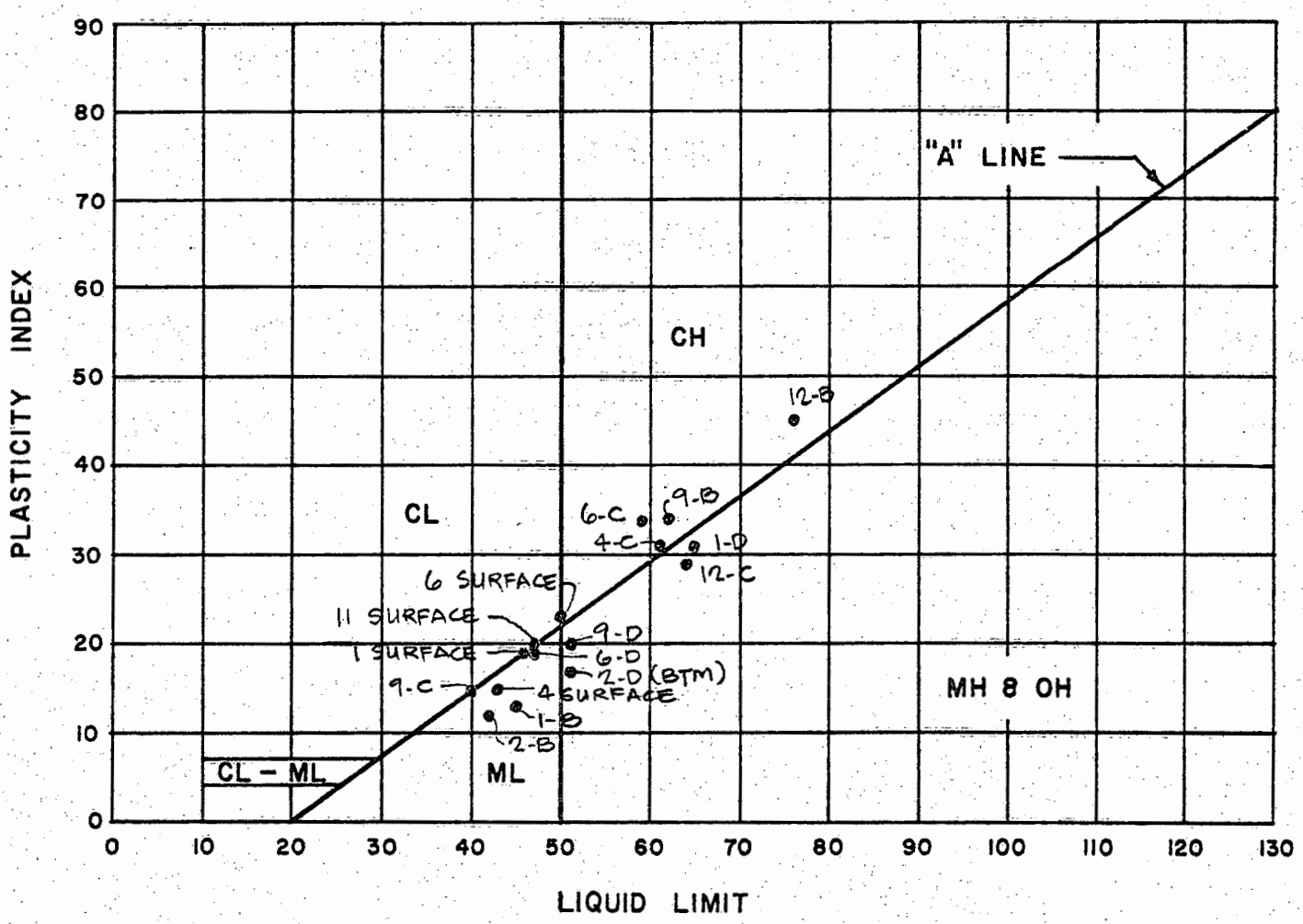
Date 3-31-73 By PJT

3-470

PLASTICITY CHART

PROJECT: SEARS ROEBUCK & COMPANY
WAREHOUSE & OUTLET STORE

LOCATION: WAIAU, OAHU, HAWAII



DATE 3-31-73 BY BJ

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

8-872

MOISTURE–DENSITY CURVE (AASHO T-180-57, METHOD A)

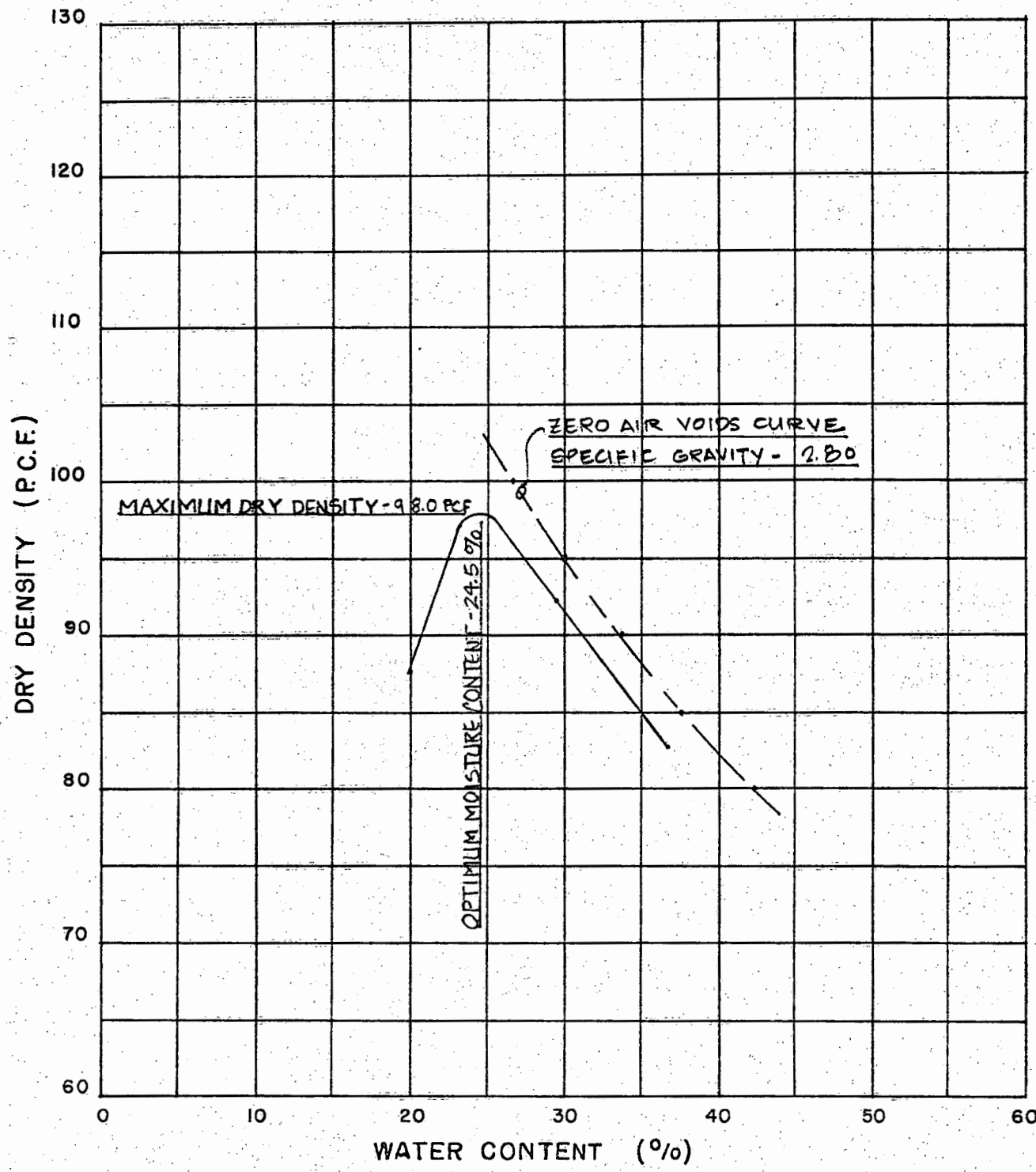
PROJECT: SEARS ROEBUCK & CO. WAREHOUSE & OUTLET STORE

LOCATION: WAIAU, OAHU, HAWAII

SAMPLE NO.: 1 SURFACE

SAMPLE DESCRIPTION: REDDISH-BROWN SILTY CLAY

AGGREGATE: 1/4" MINUS
MOLD SIZE: 4" Ø 4.584" HIGH
HAMMER: 10 LBS. 18" DROP
LAYERS: 5
BLOWS: 25 / LAYER



WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

DATE 3-14-73 BY JS

MOISTURE–DENSITY CURVE (AASHO T-180-57, METHOD A)

PROJECT: SEARS ROEBUCK & CO. WAREHOUSE & OUTLET STORE

LOCATION: WAIAU, OAHU, HAWAII

SAMPLE NO.: 4 SURFACE

SAMPLE DESCRIPTION: REDDISH-BROWN SILTY CLAY

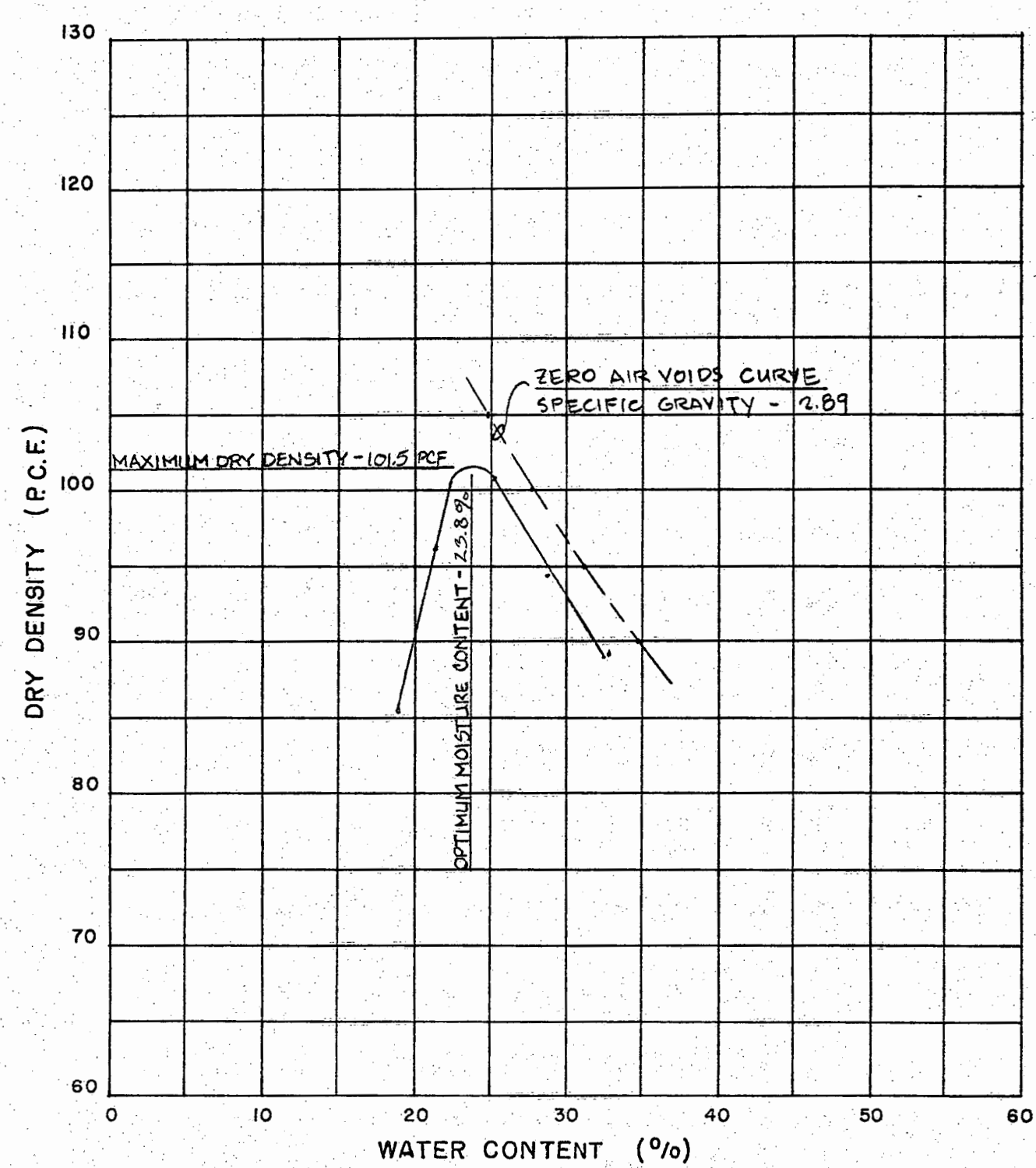
AGGREGATE: 1/4" MINUS

MOLD SIZE: 4"Ø x 4.584" HIGH

HAMMER: 10 LBS. 18" DROP

LAYERS: 5

BLOWS: 25/LAYER



WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

DATE 3-20-73 BY JS

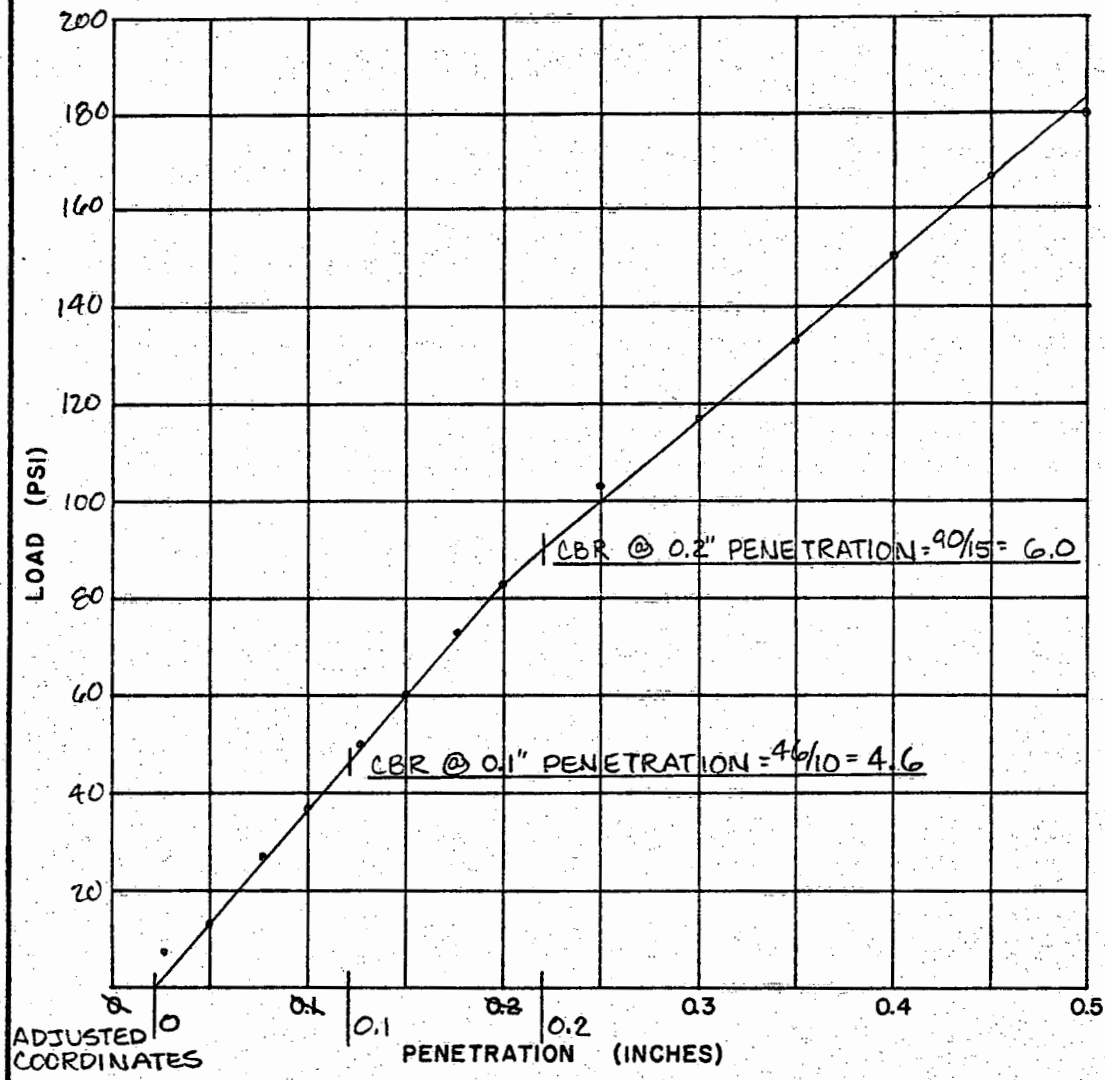
CBR TEST

PROJECT: SEARS ROEBUCK & CO.
WAREHOUSE & OUTLET STORE

LOCATION: WAIAU, OAHU, HAWAII

SAMPLE NO: 1 SURFACE

SAMPLE DESCRIPTION: REDDISH-BROWN SILTY CLAY



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	20	7
0.050	40	13
0.075	80	27
0.100	110	37
0.125	150	50
0.150	180	60
0.175	220	73
0.200	250	83
0.250	310	103
0.300	350	117
0.350	400	133
0.400	450	150
0.450	500	167
0.500	540	180

AGGREGATE 1/4" MINUS
HAMMER WEIGHT 10 LBS
HAMMER DROP 18"
No. OF BLOWS 56/LAYER
No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 26.8
MOLDING DRY DENSITY, P.C.F. 97.0
CBR @ 0.1" PENETRATION
DAYS SOAKED 4

DATE 3-17-73 BY CS & EM
DATE 3-19-73 BY NI

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

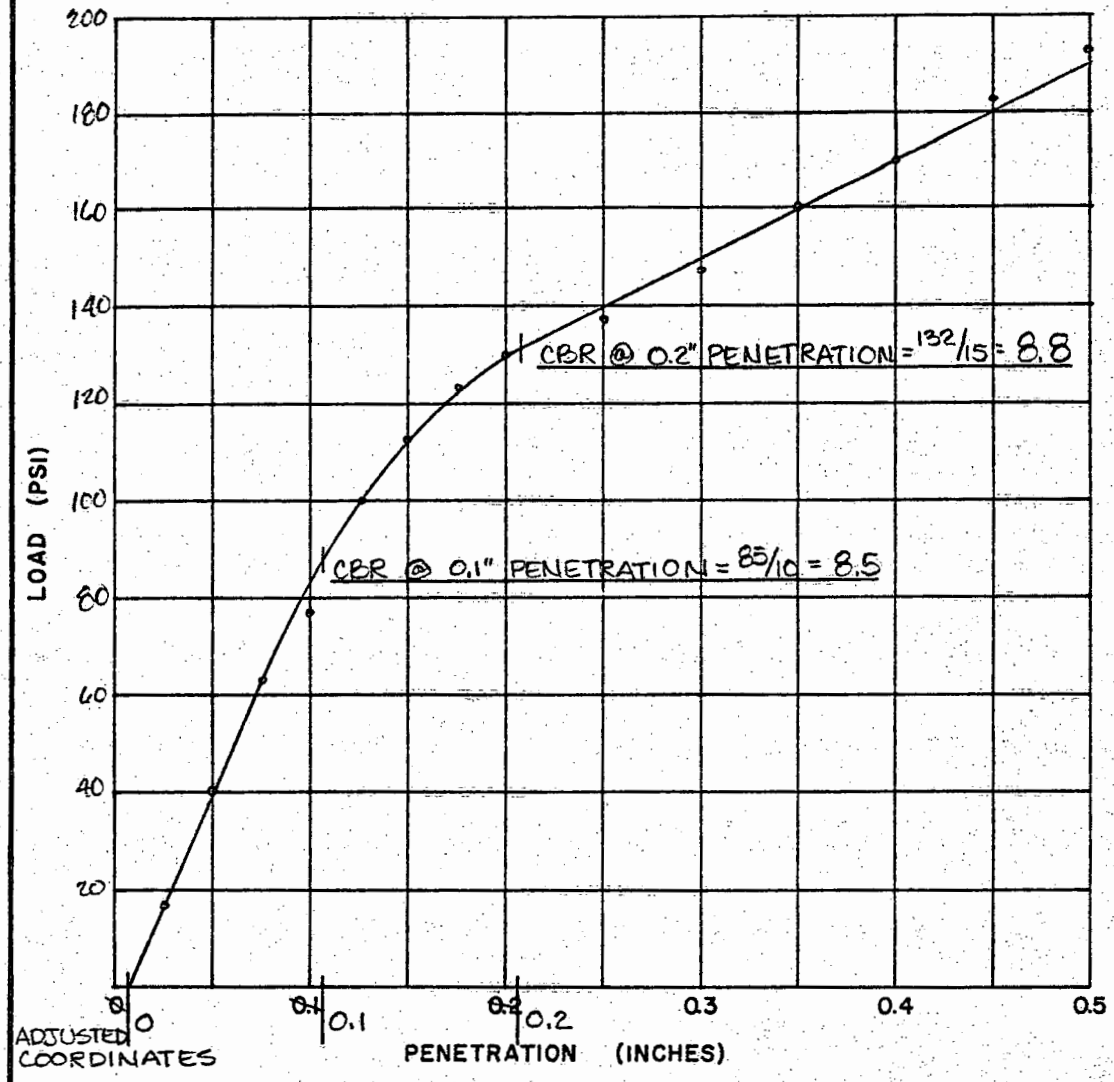
CBR TEST

PROJECT: SEARS ROEBUCK & COMPANY
WAREHOUSE & OUTLET STORE

LOCATION: WAIAU, OAHU, HAWAII

SAMPLE NO: 4 SURFACE

SAMPLE DESCRIPTION: REDDISH-BROWN SILTY CLAY



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	50	17
0.050	120	40
0.075	190	63
0.100	230	77
0.125	300	100
0.150	340	113
0.175	370	123
0.200	390	130
0.250	410	137
0.300	440	147
0.350	480	160
0.400	510	170
0.450	550	183
0.500	580	193

AGGREGATE 1/4" MINUS
HAMMER WEIGHT 10 LBS
HAMMER DROP 18"
No. OF BLOWS 56/LAYER
No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 22.5
MOLDING DRY DENSITY, P.C.F. 96.2
CBR @ 0.1" PENETRATION 8.5
DAYS SOAKED 4

DATE 3-24-73 BY CS & EM
DATE 3-26-73 BY NI

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

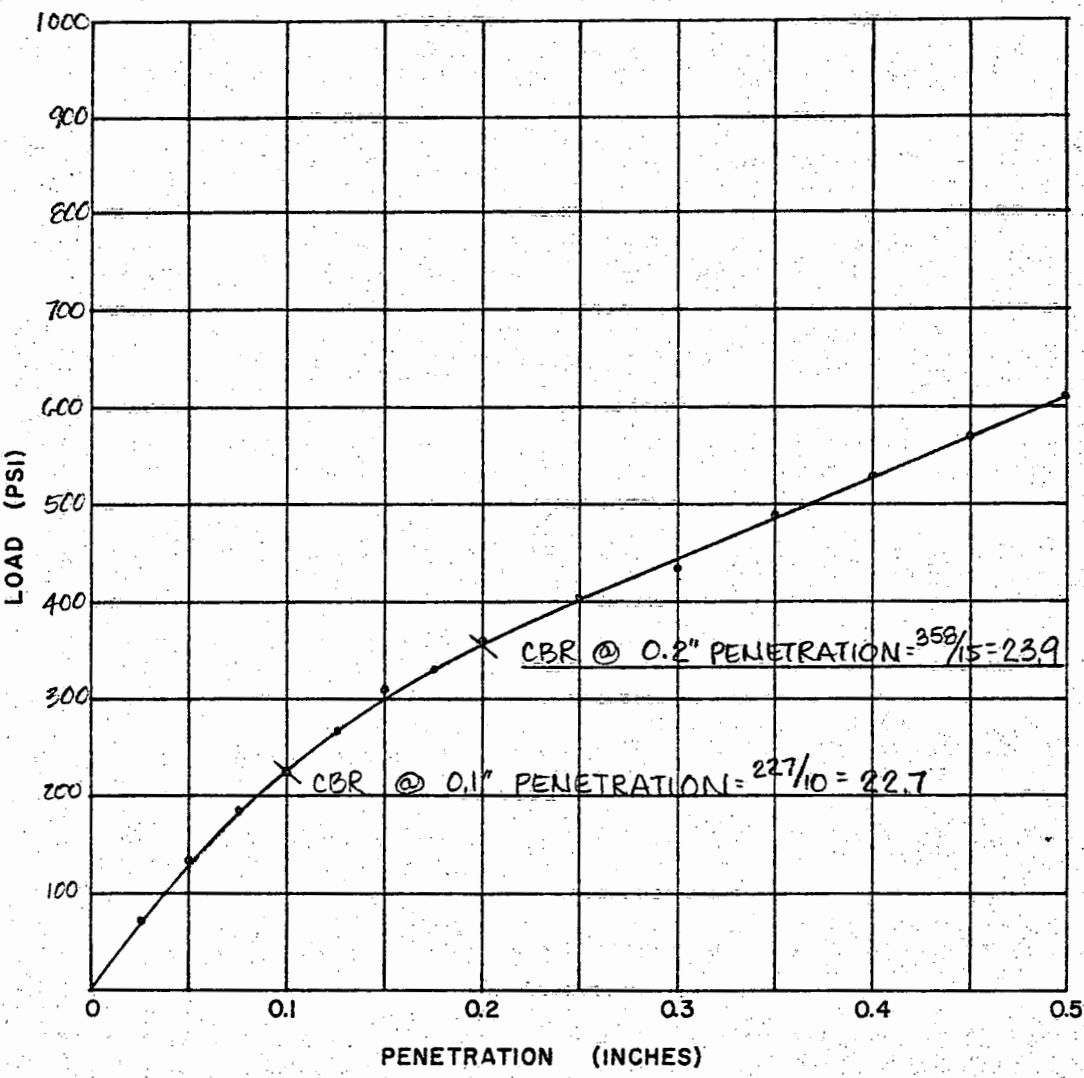
CBR TEST

PROJECT: SEARS ROEBUCK & COMPANY
WAREHOUSE & OUTLET STORE

LOCATION: WAIAU, OAHU, HAWAII

SAMPLE NO: 6 SURFACE

SAMPLE DESCRIPTION: REDDISH-BROWN SILTY CLAY W/SOME DECOMPOSED ROCK



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	220	73
0.050	410	137
0.075	555	185
0.100	680	227
0.125	805	268
0.150	920	307
0.175	1000	333
0.200	1080	360
0.250	1215	405
0.300	1315	438
0.350	1470	490
0.400	1590	530
0.450	1715	572
0.500	1825	608

AGGREGATE 1/4" MINUS
HAMMER WEIGHT 10 LBS
HAMMER DROP 18"
No. OF BLOWS 56/LAYER
No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 22.5
MOLDING DRY DENSITY, P.C.F. 104.4
CBR @ 0.1" PENETRATION 22.7
DAYS SOAKED 4

DATE 3-27-73 BY BS & CS
DATE 3-28-73 BY NI

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

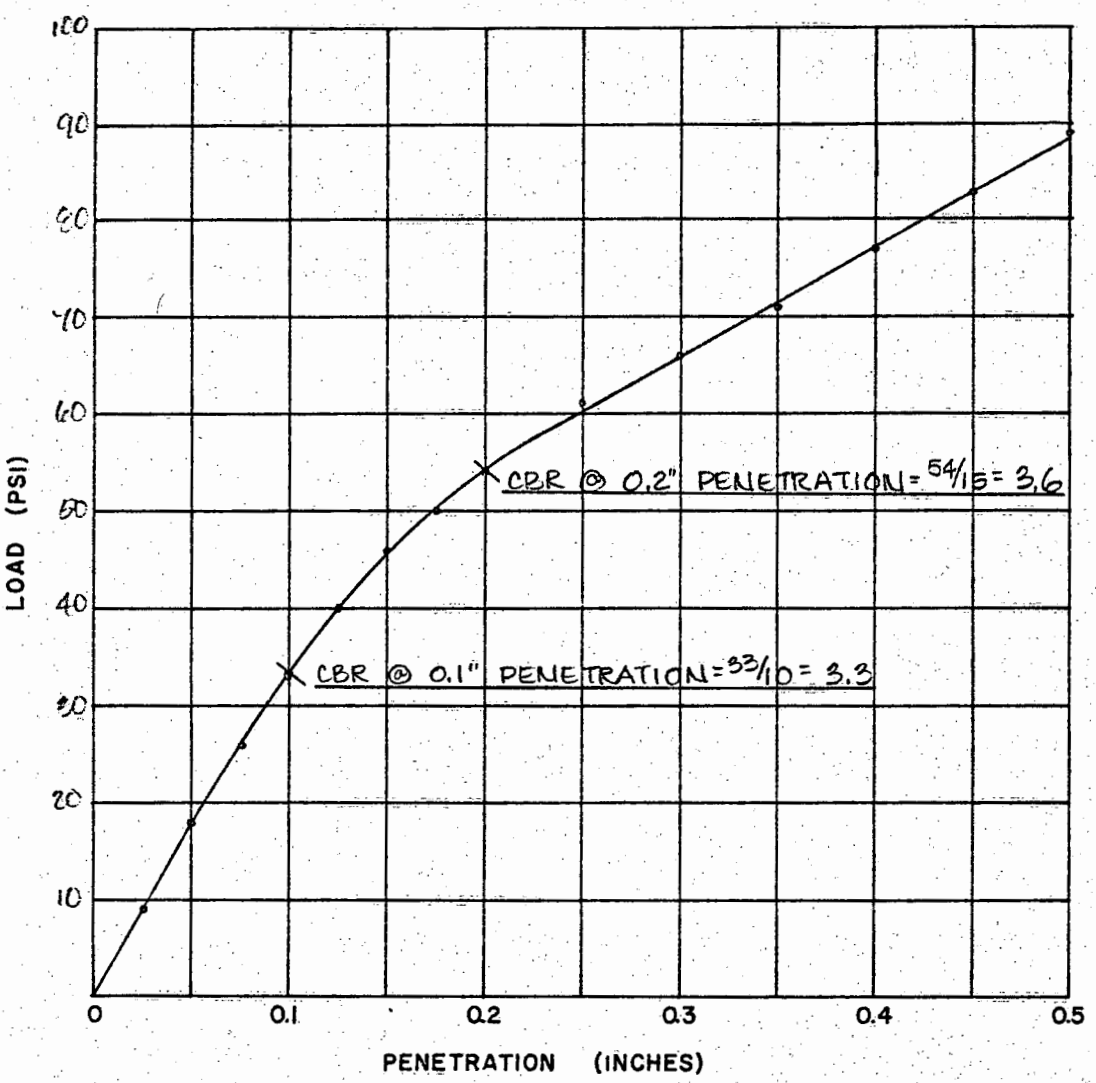
CBR TEST

PROJECT: SEARS ROEBUCK & COMPANY
WAREHOUSE & OUTLET STORE

LOCATION: WAIAU, OAHU, HAWAII

SAMPLE NO: II SURFACE @ 0.5'-1.5'

SAMPLE DESCRIPTION: REDDISH-BROWN SILTY CLAY W/DECOMP. ROCK



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	27	9
0.050	53	18
0.075	78	26
0.100	100	33
0.125	120	40
0.150	138	46
0.175	150	50
0.200	162	54
0.250	182	61
0.300	198	66
0.350	213	71
0.400	232	77
0.450	250	83
0.500	267	89

AGGREGATE 1/4" MINUS
HAMMER WEIGHT 10 LBS
HAMMER DROP 18"
No. OF BLOWS 56/LAYER
No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 22.4
MOLDING DRY DENSITY, P.C.F. 99.6
CBR @ 0.1" PENETRATION 3.3
DAYS SOAKED 4

DATE 2-23-73 BY BS
DATE 2-26-73 BY NI

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CIVIL, STRUCTURAL, SOILS ENGINEERS

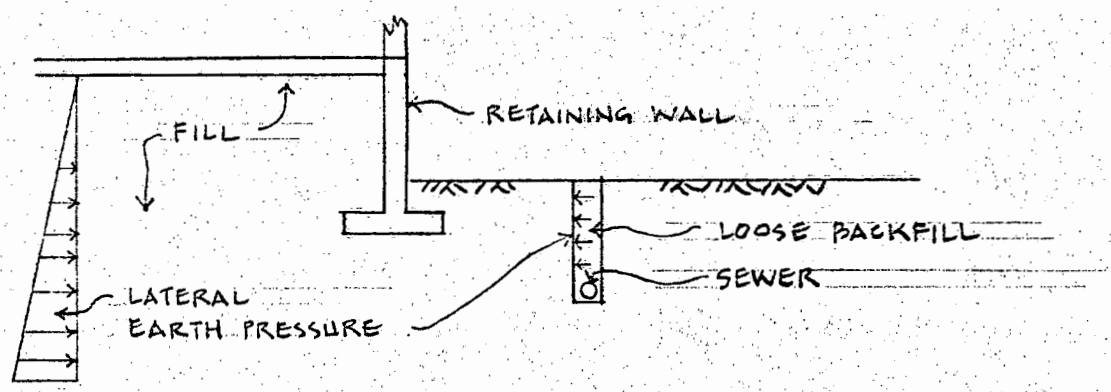
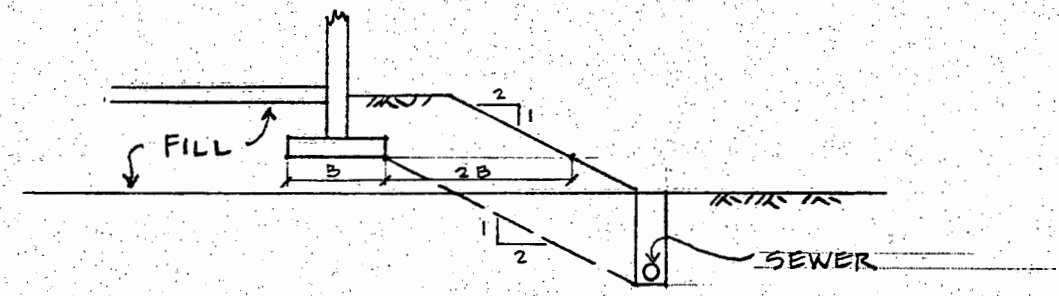
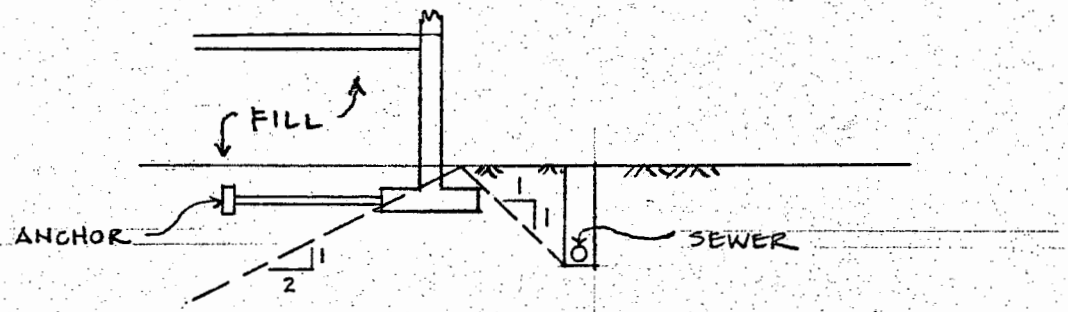


FIGURE 1: SHOWING LATERAL EARTH PRESSURE NEXT TO SEWER

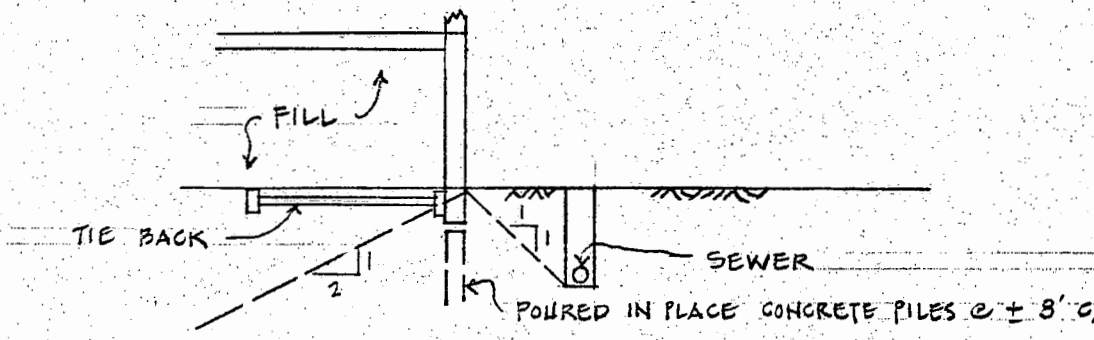
NOT TO SCALE



2-A: SPREAD FOOTING



2-B: SPREAD FOOTING W/ANCHOR



2-C: PILE FOUNDATION

FIGURE 2: SHOWING FOUNDATION W/RESPECT TO SEWER LINE

NOT TO SCALE

SEARS, ROEBUCK AND COMPANY
WAREHOUSE AND OUTLET STORE
WAIAH, OAHU, HAWAII

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

APRIL, 1973

LIMITATIONS

In general, soil formations are commonly erratic and rarely uniform or regular. The boring logs indicate the approximate subsurface soil conditions encountered only at the drill holes where the borings were made at the times designated on the logs and may not represent conditions at other locations or at other dates. Soil conditions and water levels may change with the passage of time and construction methods or improvements at the site.

During construction, should subsurface conditions much different from those in the borings be observed, encountered, or otherwise indicated, we should be advised immediately to review or reconsider our recommendations in light of the new developments.

If there is a substantial lapse of time between the submission of this report and the start of work at the site, or if conditions have changed due to natural causes, plan changes, or construction operations at or adjacent to the site, it is recommended that this report be reviewed to determine the applicability of the recommendations considering the time lapse and the changed conditions.

Our professional services were performed, findings obtained and recommendations prepared in accordance with generally accepted engineering practices. This warranty is in lieu of all other warranties expressed or implied.